Worked Solutions

Exponential Functions Q.2

differentiate the function $y = e^{x^3}$

The **Chain Rule** is used when differentiating a 'composite function', which is described as a function of another function.

The derivatives of the functions are linked by the equation:

$$\frac{dy}{dx} = \frac{dy}{du} \cdot \frac{du}{dx}$$

for $y = e^{x^3}$

let u be the inner function: $u = x^3$

the outer function is: $y = e^{u}$

taking derivatives with respect to u and y respectively,

$$\frac{du}{dx} = 3x^2 \qquad \text{and} \qquad \frac{dy}{du} = e^u$$

substituting these results into the Chain Rule equation,

$$\frac{dy}{dx} = e^u \cdot 3x^2$$

substituting for $u = x^3$,

$$\frac{dy}{dx} = e^{x^3} \cdot 3x^2$$

simplifying,

$$\frac{dy}{dx} = 3x^2 e^{x^3}$$